

JUL 10 1919

Description and Specifications of Method  
Used and Results Attained in the Technical  
Application of the Fairnault Cinema Sand  
Test System for Aircraft as Shown in the  
Film Herewith Deposited.

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and Leslie Fairfax Naulty, of New York, U.S.A.

The Fairnault Cinema Sand Testing System was invented to show the effect of airflow across aerofoils and other parts of an aircraft that designers, constructors and users might see the actual results of propellor thrust upon wing sections. Hitherto there has been no satisfactory method by which this could be done.

What the airman is interested in particularly is the effect of the airflow from the moment it strikes the leading edge of the aerofoils of an aircraft until it has flown astern of the trailing edge. The frontal air attack and the back wash of the airflow are important factors in flight and hitherto all knowledge of the effect of these elements has been speculative. If it were possible to see the airflow many disputed questions, could be readily settled.

Attempts have been made to do this by the use of smoke and ~~water~~ water but the smoke is lighter than air and highly compressible so it is impossible to get a true idea of the action of airflow from the moment the airflow strikes the leading edge, as the method has been to blow the smoke from a place ahead of the leading edge. As airplanes fly in the air and do not float in water, tests in water are not satisfactory.

So Edwin Fairfax Naulty and Leslie Fairfax Naulty devised a system by means of which the actual airflow could be seen and the desired results obtained.

A power plant equipped with a propellor is set up in suitable position. This provides a determinate airflow, the speed of which is under control. A chosen model, of practical size, of an aerofoil is then set up on a suitable holding frame or structure so the model is in the line of the airflow generated by the power plant and propellor. On the model to be tested is carefully sifted, by manual or mechanical means, selected sand or other granular substance. Sand is preferred and was used in the cinema tests herewith deposited. A curtain is provided between the power plant and propellor and the model. The power plant is started and operated until the propellor has reached the desired revolutions per minute. This achieved the curtain is withdrawn from between the propellor and the model being tested when the airflow sharply strikes the model. The sand, or other granular material, is blown off the model by the airflow and it will follow the exact contour of the airflow across the model.

From visual observation of the action of the sand the aviation technician is enabled to ascertain the amount of lift, lift over drift, drag astern and other factors. By human observation is open to error and conditions are often misinterpreted.

The camera, however, has no personal equation, so to record the results of any experiment of this ~~xxxx~~ nature the inventors photograph the action of the sand impregnated airflow. A still photograph gives only one impression, a cinema photographic series gives many impressions. So at a suitable place, according to whether a plan, side, under, or angular view is desired a cinema, or motion picture camera is set up, properly equipped.

The film speed of such camera may be the usual one of 16-18 pictures per second or it may range as high as 200 plus pictures per second. The faster the motion pictures are taken the slower the apparent action when the resulting positive is projected. Both methods have value and both are covered in the invention.

The camera is kept in operation until all the sand is blown away. If desired additional sand may be sifted over the model and the process of photographing continued, on the same film.

The film is then developed in the usual manner and from the negatives obtained as many positives as are required are made. The positive is then placed in a projecting machine and the motion pictures thrown on a suitable screen.

The result is that aviation technicians and others are enabled to see the effect of the airflow as indicated by the flying sand and thereby to correct faults in construction of wing sections or other parts of aircraft as well as to observe the actual action of airflow from an airscrew under varying conditions of wind pressure.

If the photography has been done at normal speed certain results are obtained. If the speed is super-speed the projection of the pictures appears so slow that the action can be observed in minute detail.

Further the technician can study the film itself without projection and panel by panel and thus observe many results that his eye might miss in the projection. Enlargements of critical or particularly valuable single pictures can be made and studied.

The Fairnault Cinema Sand Testing System can be operated in the open air or in a suitably prepared building or housing where the necessary artificial light can be provided, outside or natural air currents excluded and all factors controlled.



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Further a battery of cameras can be used to take the attack, the flow across the aerofoil and the back wash and the results can be projected or otherwise examined.

Since it is necessary to provide a background again which the sand or other granular material can be seen various recording instruments may be mounted on this back ground and photographed at the same time the tests are photographed. These instruments would be provided with recording dials which would show the revolutions per minute of the airscrew, the time occupied in making the test, the heat and humidity of the air and the barometric pressure and all other technical factors in the test.

The motion picture film herewith deposited shows in part test made of 19 differently contoured aerofoil models and of the upper and under surfaces of each.

The value of the Fairnault Cinema Sand Tests is increased by the fact that the film may be used to train student aviators and aviation technicians and others interested in the art.

*Edwin Fairfax Naulty*

Edwin Fairfax Naulty

*Leslie Fairfax Naulty*

Leslie Fairfax Naulty.

Washington, July 10, 1919.

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EDWIN FAIRFAX NAULTY  
AERONAUTICAL ENGINEER

FAIRNAULT ELEVATED STEEL AIRPORT  
FAIRNAULT FLIGHTCRAFT

~~24 FIFTH AVENUE, NEW YORK, N.Y. U.S.A.~~

Washington, D.C. April 14, 1941.  
P.O. Box 511, Old House Office  
Building, Capitol Hill.

The Registrar of Copyrights,  
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Washington, D.C.

Dear Colonel Bouve:

For submission to the Committees on Claims of the Senate and House I want to have made two sets of negatives of three, letter size, sheets of typed explanations of my Cinema-Sand Tests, on Film, of airflow across a series of airfoils, or wing sections, filed in Class M, May 2, 1919.

Mr Howell got out the film for me and it is now in his office together with the typed matter. I do not want the film itself, only the typed sheets. The work of photostating is to be done on the order of Representative *Wm Barry* ~~Secret of Ohio~~, Chairman of the Library Committee. All details have been attended to *of New York* so this is the required formal request from the Copyrightor.

Very truly yours

*Edwin Fairfax Naulty*

*Originals to be  
returned to  
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photostating*

EDWIN FAIRFAX NAULTY  
AERONAUTICAL ENGINEER

Colonel Bouve'  
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